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COMMONWEALTH of VIRGINIA

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April 22, 2021

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Mr. Bernard Logan, Clerk
c/o Document Control Center
State Corporation Commission
P.O. Box 2118
Richmond, Virginia 23218

RE: ***Petition of Appalachian Power Company, For approval of a rate adjustment clause, the E-RAC, for costs to comply with state and federal environmental regulations pursuant to § 56-585.1 A 5 e of the Code of Virginia***
Case No. PUR-2020-00258

Dear Mr. Logan:

On April 9, 2021, the Office of the Attorney General, Division of Consumer Counsel filed with the State Corporation Commission the testimony and exhibits of Mr. Scott Norwood in the above-captioned matter. Consumer Counsel has since realized that the final printed PDF file did not include the exhibits that are identified in the table of contents and the one-page summary. Please find enclosed for electronic filing, corrected and redline versions of Mr. Norwood's testimony and exhibits.

Thank you for your assistance in this matter.

Yours truly,

/s/ C. Mitch Burton, Jr.

C. Mitch Burton, Jr.
Assistant Attorney General

Enclosures

cc: Service list

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the foregoing was served on April 22, 2021, by electronic mail, to:

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/s/ C. Mitch Burton Jr.
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Summary of Direct Testimony of Scott Norwood

Mr. Norwood's testimony addresses the reasonableness of APCo's proposal to invest approximately $250 million for environmental compliance projects at the Company's Amos and Mountaineer coal-fired plants to meet requirements of the EPA's CCR and ELG rules, as well as the reasonableness of the revenue requirement for these investments that the Company proposes to recover through its proposed E-RAC mechanism. My primary findings and recommendations on these issues are as follows:

1) APCo's PLEXOS analysis supporting the Company's proposed $250 million investment for CCR and ELG compliance at the Amos and Mountaineer plants fails to explicitly consider impacts of the Virginia Clean Economy Act ("VCEA") and the risk of potential compliance cost increases due to future environmental regulations. The selected Case 1 analysis also assumes a 2040 retirement date for the Amos units which is unjustified and inconsistent with the 2032/2033 retirement dates for the Amos units supported by the Company in its 2020 Triennial Review Case. These flaws serve to unreasonably inflate the forecasted benefits of the Company's selected Case 1 over other compliance options that were evaluated.

2) Even with the flaws in APCo's PLEXOS analysis, the forecasted benefits of the Case 1 plan are less than 0.85% of total forecasted costs over the 30-plus year study period, when compared to forecasted costs of the next lowest cost option. This 0.85% forecasted benefit is insignificant given the uncertainty inherent in utility production cost analyses over such a long period of time, and therefore does not conclusively demonstrate that the Company's proposed $250 million investment for CCR and ELG compliance projects at the Amos and Mountaineer plants is justified.

3) APCo's selected compliance Case 1 is much riskier than the other two compliance cases evaluated by APCo, considering that it would involve the highest level of fixed investment and assumes that the Amos units would operate until 2040, without incurring significant additional investment for environmental 1 compliance or for repair of major plant components.

4) APCo's requested depreciation expense for proposed compliance investments for the Amos coal units is based on a 9.52% depreciation rate that assumes the Amos units are retired in 2033; however, the Company's economic analysis supporting the Amos compliance projects assume that the units do not retire until 2040. This inconsistency in assumed retirement dates results unreasonably overstates depreciation expense included in APCo's E-RAC revenue requirement by approximately $227,000. For the above reasons, I do not recommend that the Commission approve APCo's request for approval and cost recovery for the $250 million of capital investment and related O&M costs to implement CCR and ELG compliance projects at the Amos and Mountaineer plant as proposed under Case 1. If the Commission approves APCo's proposed compliance investment, the Company's requested E-RAC revenue requirement should be reduced by approximately $227,000 to properly reflect the 2040 retirement date assumed by the Company to justify the Amos and Mountaineer compliance investments.

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COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

PETITION OF	)	
	)	
APPALACHIAN POWER COMPANY	)	
	)	
For approval of a rate adjustment clause, the E-RAC, for costs to comply with state and federal environmental regulations pursuant to § 56-585.1 A 5 e of the Code of Virginia	))))	**CASE NO. PUR-2020-00258**

DIRECT TESTIMONY

OF

SCOTT NORWOOD

ON BEHALF OF

THE OFFICE OF THE ATTORNEY GENERAL

DIVISION OF CONSUMER COUNSEL

APRIL 9, 2021

CASE NO. PUR-2020-00258

DIRECT TESTIMONY OF SCOTT NORWOOD

TABLE OF CONTENTS

EXHIBITS

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Scott Norwood. I am President of Norwood Energy Consulting, L.L.C. My business address is P.O. Box 30197, Austin, Texas 78755-3197.

Q. WHAT IS YOUR OCCUPATION?

A. I am an energy consultant specializing in the areas of electric utility regulation, resource planning, and energy procurement.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I am an electrical engineer with approximately 40 years of experience in the electric utility industry. I began my career as a power plant engineer for the City of Austin's Electric Utility Department where I was responsible for electrical maintenance and design projects for the City's three gas-fired power plants. In January 1984, I joined the staff of the Public Utility Commission of Texas, where I was responsible for addressing resource planning, fuel, and purchased power cost issues in electric rate and plant certification proceedings before the Texas Commission. Since 1986 I have provided utility regulatory consulting, resource planning, and power procurement services to public utilities, electric consumers, industrial interests, municipalities, and state government clients. I have testified in over 200 utility regulatory proceedings over the last 20 years, before state regulatory commissions in Alaska, Arkansas, Florida, Georgia, Illinois, Iowa, Kentucky, Louisiana, Michigan, Missouri, New Jersey, Ohio, Oklahoma, Texas, Virginia, Washington, and Wisconsin.[1]

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS CASE?

A. I am testifying on behalf of the Office of the Attorney General, Division of Consumer Counsel ("Consumer Counsel").

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE STATE CORPORATION COMMISSION?

A. Yes. I have testified on behalf of Consumer Counsel in numerous past regulatory proceedings before the Virginia State Corporation Commission ("Commission"), including cases that involved electric restructuring, base rate, fuel recovery, power plant certification, renewable energy acquisition proposals, demand-side management, and major distribution reliability projects. I have testified on behalf of Consumer Counsel in many past cases involving Appalachian Power Company ("APCo" or "Company"), including the Company's 2020 Triennial Review proceeding and several other past APCo base rate cases, a case involving the Company's acquisition of Ohio Power Company's 867 MW ownership share of Amos Unit 3, fuel factor proceedings, and other matters relevant to the issues addressed by my testimony in this case. I have also testified in regulatory proceedings involving other AEP affiliates of APCo, including Public Service Company of Oklahoma ("PSO"), Southwestern Electric and Power Company ("SWEPCO"), AEP Texas North Company and AEP Texas Central Company.

[1] See Exhibit SN-1 for additional details on my background and experience.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to present my findings and recommendations regarding: the reasonableness of APCo's request for approval of a rate adjustment clause ("the E-RAC") to recover capital investments and operations and maintenance ("O&M") expenses that are necessary to comply with state and federal environmental regulations pursuant to § 56-585.1 A 5 (e) of the Code of Virginia ("the E-RAC Statute"). More specifically, my testimony focuses on the reasonableness of APCo's proposed capital investments to meet regulations of the United States Environmental Protection Agency ("EPA") for disposal of coal combustion residuals ("CCR Rule") and to meet requirements of the EPA's Steam Electric Effluent Limitations Guidelines ("ELG Rule"). My testimony also addresses the inconsistency of APCo's proposal to recover depreciation expense for proposed environmental compliance investments for the Amos coal-fired units based on depreciation rates that assume retirement of the units in 2033, when the Company's economic analysis supporting the Amos compliance investments assumes the Amos units would not retire until 2040.

Q. HAVE YOU PREPARED ANY EXHIBITS TO SUPPORT YOUR TESTIMONY?

A. Yes. I have prepared 7 exhibits, which are attached to my testimony.

II. SUMMARY OF TESTIMONY

Q. PLEASE SUMMARIZE YOUR TESTIMONY AND RECOMMENDATIONS.

A. My testimony addresses the reasonableness of APCo's proposal to invest approximately $250 million for environmental compliance projects at the Company's Amos and

Mountaineer coal-fired plants to meet requirements of the EPA's CCR and ELG rules, as well as the reasonableness of the revenue requirement for these investments that the Company proposes to recover through its proposed E-RAC mechanism. My primary findings and recommendations on these issues are as follows:

1) APCo's PLEXOS analysis supporting the Company's proposed $250 million investment for CCR and ELG compliance at the Amos and Mountaineer plants fails to explicitly consider impacts of the Virginia Clean Economy Act ("VCEA") and the risk of potential compliance cost increases due to future environmental regulations. The selected Case 1 analysis also assumes a 2040 retirement date for the Amos units which is unjustified and inconsistent with the 2032/2033 retirement dates for the Amos units supported by the Company in its 2020 Triennial Review Case. These flaws serve to unreasonably inflate the forecasted benefits of the Company's selected Case 1 over other compliance options that were evaluated.

2) Even with the flaws in APCo's PLEXOS analysis, the forecasted benefits of the Case 1 plan are less than 0.85% of total forecasted costs over the 30-plus year study period, when compared to forecasted costs of the next lowest cost option. This 0.85% forecasted benefit is insignificant given the uncertainty inherent in utility production cost analyses over such a long period of time, and therefore does not conclusively demonstrate that the Company's proposed $250 million investment for CCR and ELG compliance projects at the Amos and Mountaineer plants is justified.

3) APCo's selected compliance Case 1 is much riskier than the other two compliance cases evaluated by APCo, considering that it would involve the highest level of fixed investment and assumes that the Amos units would operate until 2040, without

incurring significant additional investment for environmental compliance or for repair of major plant components.

4) APCo's requested depreciation expense for proposed compliance investments for the Amos coal units is based on a 9.52% depreciation rate that assumes the Amos units are retired in 2033; however, the Company's economic analysis supporting the Amos compliance projects assume that the units do not retire until 2040. This inconsistency in assumed retirement dates results unreasonably overstates depreciation expense included in APCo's E-RAC revenue requirement by approximately $227,000.

For the above reasons, I do not recommend that the Commission approve APCo's request for approval and cost recovery for the $250 million of capital investment and related O&M costs to implement CCR and ELG compliance projects at the Amos and Mountaineer plant as proposed under Case 1. If the Commission approves APCo's proposed compliance investment, the Company's requested E-RAC revenue requirement should be reduced by approximately $227,000 to properly reflect the 2040 retirement date assumed by the Company to justify the Amos and Mountaineer compliance investments.

III. APCO'S E-RAC PROPOSAL

Q. WHAT IS THE AGE AND CAPACITY RATINGS OF APCO'S AMOS AND MOUNTAINEER COAL UNITS?

A. The capacity ratings, commercial operation dates and scheduled retirement dates for the Amos and Mountaineer coal units are summarized below in Table 1.

Table 1

Amos and Mountaineer Capacity, Commercial Operation and Retirement Dates[2]

Plant/Unit	Rated Capacity MW	Commercial Operation Year	Retirement Year	Age at Retirement
Amos 1	800	1971	2032	61
Amos 2	800	1972	2032	60
Amost 3	1,330	1973	2033	60
Mountaineer 1	1,320	1980	2040	60
Total	4,250			

Q. **PLEASE DESCRIBE APCO'S PROPOSED INVESTMENTS FOR COMPLIANCE WITH THE EPA'S CCR AND ELG REGULATIONS AT THE COMPANY'S AMOS AND MOUNTAINEER COAL-FIRED PLANTS.**

A. APCo proposes to install: 1) dry ash handling systems; 2) new lined wastewater ponds, and 3) water biological treatment systems with ultrafiltration to meet CCR and ELG regulations at the Amos and Mountaineer plants.[3]

Q. **WHAT ARE THE ESTIMATED CAPITAL COSTS FOR THESE COMPLIANCE PROJECTS?**

A. The estimated capital costs, including asset retirement obligations, total approximately $250 million, as summarized in Table 2:

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2 Source is APCo's response to OAG 2-4 in Case No. PUR-2020-00015.

3 See APCo witness Ross's direct testimony, page 4.

Table 2
Amos and Mountaineer CCR and ELG Capital Costs ($Millions)[4]

	Amos 1-3	Mountaineer	Total
CCR	$72.7	$52.1	$124.8
ELG	$104.4	$20.8	$125.2
Total	$177.1	$72.9	$250.0

Q. WHAT ARE THE SCHEDULED IN-SERVICE DATES OF THE AMOS AND MOUNTAINEER CCR AND ELG INVESTMENTS?

A. The scheduled in-service dates for the Amos and Mountaineer CCR and ELG projects are summarized in Table 3 below:

Table 3
Scheduled In-Service Dates for CCR and ELG Projects[5]

	Amos	Mountaineer
Dry Ash Handling Systems	December 2022	May 2022
Lined Wastewater Ponds	October 2023	December 2023
Water Treatment Systems	December 2023	December 2022

Q. WHAT IS THE ANNUAL REVENUE REQUIREMENT FOR THESE PROJECTS THAT APCO SEEKS TO RECOVER THROUGH ITS PROPOSED E-RAC?

A. APCo requests recovery of $31.6 million for compliance capital and O&M costs of the proposed CCR and ELG investments during the Rate Year, through the Company's

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4 Source is APCo witness Martin's direct testimony, page 15.

5 See APCo witness Ross's direct testimony, page 4.

proposed E-RAC mechanism.[6]

Q. WHAT ARE THE KEY QUESTIONS TO BE ANSWERED IN DETERMINING WHETHER APCO'S REQUEST FOR RECOVERY OF CCR AND ELG INVESTMENTS SHOULD BE APPROVED?

A. The key questions which must be addressed in evaluating APCo's request for approval and cost recovery for $250 million in CCR and ELG compliance investments at the Amos and Mountaineer plants are:

1) Are the proposed compliance investments reasonable and necessary?
2) Did APCo properly consider available alternatives to the proposed CCR and ELG investments?
3) Is APCo's proposed E-RAC revenue requirement reasonably calculated?

IV. <u>REASONABLENESS OF PROPOSED CCR AND ELG INVESTMENTS</u>

Q. HOW DID APCO EVALUATE WHETHER THE PROPOSED CCR AND ELG INVESTMENTS AT THE AMOS AND MOUNTAINEER PLANTS ARE REASONABLE AND NECESSARY?

A. APCo used the PLEXOS production cost simulation model to evaluate the costs of three compliance scenarios for the Amos and Mountaineer plants over a range of three commodity price forecasts. The three compliance scenarios and commodity price sensitivities evaluated by APCo are summarized in Table 4 below.

[6] See APCo's Petition, page 5. The Rate Year is October 1, 2021 through September 30, 2022.

Table 4
APCo Scenarios for Analysis of Amos and Mountaineer Compliance Options[7]

			NPV Rev. Reqt. Costs (Savings) vs Case 1 ($Millions)		
Cases	Retirement Dates	Capital Investment	Base with Carbon	Base No Carbon	Low No Carbon
Case 1: CCR/ELG Both Plants	Both Plants in 2040	$250			
Case 2: Amos CCR; Mountaineer CCR&ELG	Amos 2028; Mountaineer 2040	$146	$176	$295	$245
Case 3: CCR only Both Plants	Both in 2028	$125	$374	$622	$480

Q. **WHICH COMPLIANCE OPTION DID APCO SELECT BASED ON ITS PLEXOS ANALYSIS?**

A. APCo selected Case 1, which provides for $250 million in capital investment to install CCR and ELG projects and assumes that Amos and Mountaineer will retire in 2040.[8]

Q. **DOES APCO'S PLEXOS ANALYSIS DEMONSTRATE THAT CASE 1 IS THE LOWEST REASONABLE COST ALTERNATIVE FOR COMPLIANCE WITH OTHER EXISTING OR FUTURE ENVIRONMENTAL REGULATIONS?**

A. No. For example, APCo's PLEXOS analysis did not explicitly evaluate the cost of a resource plan that is compliant with the VCEA in any cases, and only indirectly evaluated VCEA impacts in Case 1.[9] This omission is a major deficiency in APCo's PLEXOS analysis, since the VCEA mandates that the Company develop and propose for approval the acquisition of at least 600 MW of renewable generation by 2030. In addition, over the longer planning horizon, the Company must plan to comply with a Renewable Portfolio Standard ("RPS") requirement of zero carbon emissions by 2050. These

[7] See the direct testimony of APCo witness Martin, page 4.

[8] See the direct testimony of APCo witness Martin, page 4.

[9] See Exhibit SN-2, APCo's response to OAG 2-12 and OAG 2-13.

renewable compliance costs will likely alter the level, timing, and costs of replacement energy and capacity on APCo's system, when compared to the amounts included in APCo's PLEXOS Case 1 analysis.

Moreover, beyond the proposed $250 million investment to comply with the CCR and ELG rules, APCo's analysis does not consider costs of compliance with other future environmental regulations that may impact operations of the Amos and Mountaineer plants, or other APCo power plants.[10]

Q. WHY DOES APCO'S FAILURE TO EXPLICITLY EVALUATE COST IMPACTS OF THE VCEA AND POTENTIAL FUTURE REGULATIONS UNREASONABLY BIAS THE PLEXOS RESULTS IN FAVOR OF CASE 1?

A. The primary forecasted benefit of Case 1 over other compliance alternatives evaluated by APCo's PLEXOS analysis is the avoided replacement capacity and energy that is expected to result from operating the Amos and Mountaineer units until 2040, rather than retiring the units at an earlier date. But the mandatory RPS Program will likely displace a portion of the capacity that the Company's PLEXOS analysis assumes would have to be procured if the Amos and Mountaineer units were retired early, because the VCEA-mandated requirements exist whether or not the Amos and Mountaineer units are retired. If APCo had properly evaluated the VCEA requirements in all three compliance cases evaluated in its PLEXOS analysis, the relatively small forecasted economic benefit of Case 1 over other compliance options would likely have been even smaller.

Similarly, APCo's failure to consider the risk of higher costs of compliance with future environmental regulations if the Amos and Mountaineer units were operated until

[10] See Exhibit SN-3, APCo's response to OAG 2-27.

2040, unreasonably inflates the forecasted benefits of the selected Case 1 compliance option, which are already small. These flaws in APCo's PLEXOS analysis bias the results in favor of Case 1, and against the "lower investment/earlier retirement" alternatives evaluated in compliance Case 2 and Case 3.

Q. WHY DO YOU CONSIDER THE FORECASTED BENEFITS OF APCO'S PROPOSED CASE 1 TO BE RELATIVELY SMALL?

A. APCo's PLEXOS analysis covers a 30-year study period from 2021 through 2050, plus end effects beyond 2050. As summarized in Table 5, the Company's analysis indicates that the forecasted base case benefit of Case 1 is only 0.85% when compared to the next lowest cost option over the 30+ years covered by the PLEXOS modeling analysis.

Table 5
Forecasted Savings of Case 1 Over Other Compliance Options
2021-2050 + End Effects Cumulative NPV, $Millions[11]

	Case 1 Amos + Mount CCR&ELG Both Retire 2040	Case 2 Amos CCR + Mount CCR+ELG Amos Ret 2028	Case 3 Amos + Mount CCR Only Both Retire 2028
EIA Base With Carbon	$20,578	$20,754	$20,951
Change vs Case 1		$176	$373
Case 1 Benefit, %		$\boxed{0.85\%}$	1.78%
EIA Base Without Carbon	$18,435	$18,730	$19,057
Change vs Case 1		$295	$622
Case 1 Benefit, %		1.58%	3.26%
EIA Low without Carbon	$17,088	$17,333	$17,569
Change vs Case 1		$245	$481
Case 1 Benefit, %		1.41%	2.74%

[11] See Exhibit SN-4, APCo's Schedule 46, Section 2, Statement 1.

I believe that a 0.85% forecasted benefit is insignificant considering: 1) the inherent uncertainty in forecasting utility system loads, operations and production costs for a large system over a 30+ study period; and 2) the uncertainty regarding compliance costs associated with future energy policies (such as the VCEA) and environmental regulations that may be implemented due to growing concerns regarding climate change.

Q. DO YOU HAVE OTHER CONCERNS REGARDING APCO'S PROPOSED CCR/ELG COMPLIANCE PLAN FOR THE AMOS AND MOUNTAINEER COAL UNITS?

A. Yes. I am concerned that APCo has shifted an excessive amount of risk to its customers by selecting the Case 1 compliance option which is arguably the riskiest option, and requires the highest fixed compliance investment. Again, APCo's selection of Case 1 is based on results of a PLEXOS analysis that is flawed and unduly biased in favor of Case 1, but that still forecasts relatively small benefits for Case 1. Moreover, the forecasted benefits under Case 1 are dependent on the already relatively old Amos and Mountaineer coal units operating until 2040, at which time the Amos units would be approaching 70 years in commercial operations, and Mountaineer would be 60 years old. APCo's strategy with Amos and Mountaineer appears to be inconsistent with industry trends which are moving toward earlier retirement of coal-fired generating units in response to lower market prices for energy and capacity, risks of future environmental compliance costs, and the need to reduce carbon emissions to address climate change.

Q. IS APCO'S ASSUMPTION THAT THE AMOS UNITS WILL RETIRE IN 2040 CONSISTENT WITH THE POSITION TAKEN IN THE COMPANY'S LAST RATE CASE?

A. No. In PUR-2020-00015, APCo's 2020 Triennial Review Proceeding, APCo testified in support of accelerating the retirement dates for the Amos coal units from 2040 to 2032 and 2033. Although the Company did not produce economic studies to support these new retirement dates, in response to discovery the Company noted that the 2032 and 2033 retirement dates were based on:

> a combination of engineering judgement and operating experience regarding the physical condition and the expected useful life of major plant components; the cost to repair or replace major components at the time of failure; market prices for energy related to such things as natural gas prices; and the possible impact of public policy decisions such as environmental regulations and standards related to renewable generation.[12]

Q. HAS APCO IDENTIFIED ANY CHANGES SINCE APCO'S TRIENNIAL REVIEW CASE THAT MIGHT JUSTIFY DELAYING THE RETIREMENT OF THE AMOS COAL UNITS FROM 2032 AND 2033 UNTIL 2040, AS IT HAS ASSUMED IN ITS PLEXOS ANALYSIS OF COMPLIANCE CASE 1?

A. No. In fact, APCo admits that there have been no changes in market conditions or other factors that would increase the market value of the Amos units or otherwise justify extending their retirement dates from 2032 and 2033, until 2040.[13]

Q. HOW DOES THE ASSUMED 2040 RETIREMENT DATE FOR THE AMOS UNITS IN APCO'S CASE 1 ANALYSIS IMPACT THE FORECASTED SAVINGS OF THE CASE 1 COMPLIANCE ALTERNATIVE SELECTED BY APCO?

A. As shown in Table 6 below, all of the forecasted savings for Case 1 occur during the 2028-2039 period, during which Case 1 is the only scenario that Amos would operate.

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[12] See Exhibit SN-5.

[13] See Exhibit SN-6, APCo's response to OAG 2-9.

Table 6
Forecasted Benefits/(Costs) of Case 1 vs Cases 2 and 3 by Time Periods
(Cumulative NPV, $Millions)[14]

Case/Scenario	2021-2027	2028-2039	2040-2050	End Effects	Total Study Period
EIA Base With Carbon					
Case 2 vs Case 1	-$57	$430	-$172	-$24	$177
Case 3 vs Case 1	-$65	$735	-$256	-$40	$374
EIA Base Without Carbon					
Case 2 vs Case 1	-$48	$555	-$171	-$40	$296
Case 3 vs Case 1	-$74	$993	-$243	-$53	$623
EIA Low without Carbon					
Case 2 vs Case 1	-$51	$524	-$165	-$63	$245
Case 3 vs Case 1	-$70	$844	-$249	-$45	$480

Q. **DO YOU HAVE OTHER CONCERNS WITH APCO'S PLEXOS ANALYSIS OF ENVIRONMENTAL COMPLIANCE INVESTMENTS FOR THE AMOS AND MOUNTAINEER PLANTS?**

A. Yes. I am concerned that APCo's PLEXOS analysis did not evaluate a scenario that assumes retirement and replacement of one or more of the Amos or Mountaineer units as an alternative to the $250 million compliance investment it selected under Case 1. APCo's analysis instead assumes CCR and/or ELG investments are made in all three cases that were evaluated. Due to the Company's failure to evaluate any cases that considered retirement and replacement of one or more of the Amos or Mountaineer coal units as an alternative to compliance investments, I cannot conclude with any confidence that Case 1 is the lowest reasonable cost alternative for customers. This is particularly true considering APCo's additional failure to analyze impacts of the VCEA and the risk

[14] See Exhibits SN-7 and SN-4.

that additional compliance costs could be required at Amos and Mountaineer for future environmental regulations if they were operated until 2040 as the Company assumes.

Q. PLEASE SUMMARIZE YOUR FINDINGS REGARDING APCO'S PLEXOS ANALYSIS OF ENVIRONMENTAL COMPLIANCE INVESTMENTS FOR THE AMOS AND MOUNTAINEER COAL UNITS?

A. APCo's PLEXOS analysis is flawed by failing to explicitly consider impacts of the VCEA or the risk of higher compliance costs due to future environmental regulations, and by use of an unjustified 2040 retirement date for the Amos units. These flaws serve to unreasonably inflate the forecasted benefits of Case 1 when compared to other compliance options that were evaluated. Additionally, even with these flaws, the forecasted benefits of the Case 1 plan are small and uncertain, and therefore do not conclusively demonstrate that the Company's proposed $250 million investment for CCR and ELG compliance projects is justified. Moreover, Case 1 is riskier than the other two compliance cases evaluated by APCo, considering that it would involve the highest level of fixed compliance investment and depends on the Amos and Mountaineer units operating reliably and economically until 2040, which is not assured. For these reasons, I cannot recommend that the Commission approve APCo's request for cost recovery for the full $250 million of capital investment and related O&M costs to implement CCR and ELG compliance projects at the Amos and Mountaineer plant as proposed under Case 1.

V. DEPRECIATION RATES FOR AMOS COMPLIANCE INVESTMENTS

Q. WHAT DEPRECIATION RATES IS APCO PROPOSING FOR USE IN DETERMINING THE REVENUE REQUIREMENT FOR CCR AND ELG INVESTMENTS FOR THE AMOS AND MOUNTAINEER COAL UNITS?

A. APCo is proposing that a depreciation rate of 9.52% be applied to determine the E-RAC revenue requirement for the Amos CCR and ELG compliance investments.[15] This proposed depreciation rate for the Amos CCR and ELG investments is based on a remaining life of 10.5 years, which reflects a 2033 retirement date for the Amos units.[16] The Company is proposing a 5.71% depreciation rate for compliance investments at Mountaineer, based on a 2040 retirement date for the unit.[17]

Q. IS IT REASONABLE FOR APCO TO USE A 9.52% DEPRECIATION RATE FOR AMOS COMPLIANCE INVESTMENTS AND A 5.71% RATE FOR MOUNTAINEER COMPLIANCE INVESTMENTS?

A. No. APCo indicates that its proposed 9.52% depreciation rate is based on the estimated 2032 and 2033 retirement dates for the Amos units, underlying the depreciation rates approved by the Commission in the Company's 2020 Triennial Review Case.[18] It is inconsistent to use 2032 and 2033 retirement dates for setting depreciation rates for the Amos compliance investments, when APCo used a 2040 retirement date for the Amos units in the PLEXOS Case 1 analysis, which provides the primary economic justification

[15] See APCo witness Ross's direct testimony, page 10.

[16] Ibid.

[17] Ibid.

[18] See APCo witness Ross's direct testimony, pages 9-10.

for the Company's proposed \$177.1 million Amos compliance investment.[19] In fact, APCo has proposed a 5.71% depreciation rate for the Mountaineer compliance investments based on the same 2040 retirement date that was used for the PLEXOS Case 1 analysis that supports the investments.[20] If the Commission approves APCo's \$250 million request based upon the assumption that the Amos Plant will operate through 2040, as a matter of consistency, it should consider requiring that the depreciation rates for the Amos and Mountaineer compliance investments also both be based on the same 2040 retirement date.

Q. WHAT WOULD BE THE APPROXIMATE CHANGE IN DEPRECIATION EXPENSE IF THE SAME DEPRECIATION RATE (BASED ON 2040 RETIREMENT) WAS USED FOR THE AMOS AND MOUNTAINEER COMPLIANCE INVESTMENTS?

A. I estimate that applying the same 5.71% depreciation rate to the proposed compliance investments for both the Amos and Mountaineer units would reduce APCo's proposed \$31.6 million E-RAC revenue requirement by approximately \$227,000, on a Virginia Retail basis.[21]

Q. DOES THAT CONCLUDE YOUR RESPONSIVE TESTIMONY?

A. Yes. However, I reserve the right to present oral surrebuttal testimony at the hearing to respond to any new issues that may be raised by APCo's rebuttal testimony.

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[19] As noted earlier in my testimony, the assumption that the Amos units would operate to 2040 only in Case 1, while Amos was assumed to be retired in 2028 in all other cases, was a key factor in economically justifying the Case 1 investments.

[20] See APCo witness Ross's direct testimony, page 10.

[21] See Exhibit SN-7.

EX. SN-1

DON SCOTT NORWOOD

Norwood Energy Consulting, L.L.C.

P. O. Box 30197
Austin, Texas 78755-3197
scott@scottnorwood.com
(512) 297-1889

SUMMARY

Scott Norwood is an energy consultant with over 37 years of utility industry experience in the areas of regulatory consulting, resource planning and energy procurement. His clients include government agencies, publicly-owned utilities, public service commissions, municipalities and various electric consumer interests. Over the last 15 years Mr. Norwood has presented expert testimony on electric utility ratemaking, resource planning, and electric utility restructuring issues in over 200 regulatory proceedings in Arkansas, Georgia, Iowa, Illinois, Michigan, Missouri, New Jersey, Oklahoma, South Dakota, Texas, Virginia, Washington and Wisconsin.

Prior to founding Norwood Energy Consulting in January of 2004, Mr. Norwood was employed for 18 years by GDS Associates, Inc., a Marietta, Georgia based energy consulting firm. Mr. Norwood was a Principal of GDS and directed the firm's Deregulated Services Department which provided a range of consulting services including merchant plant due diligence studies, deregulated market price forecasts, power supply planning and procurement projects, electric restructuring policy analyses, and studies of power plant dispatch and production costs.

Before joining GDS, Mr. Norwood was employed by the Public Utility Commission of Texas as Manager of Power Plant Engineering from 1984 through 1986. He began his career in 1980 as Staff Electrical Engineer with the City of Austin's Electric Utility Department where he was in charge of electrical maintenance and design projects at three gas-fired power plants.

Mr. Norwood is a graduate of the college of electrical engineering of the University of Texas.

EXPERIENCE

The following summaries are representative of the range of projects conducted by Mr. Norwood over his 30-year consulting career.

Regulatory Consulting

Oklahoma Industrial Energy Consumers - Assisted client with technical and economic analysis of proposed EPA regulations and compliance plans involving control of air emissions and potential conversion of coal-to-gas conversion options.

Cities Served by Southwestern Electric Power Company – Analyzed and presented testimony regarding the prudence of a $1.7 billion coal-fired power plant and related settlement agreements with Sierra Club.

New York Public Service Commission - Conducted inter-company statistical benchmarking analysis of Consolidated Edison Company to provide the New York Public Service Commission with guidance in determining areas that should be reviewed in detailed management audit of the company.

Oklahoma Industrial Energy Consumers - Analyzed and presented testimony on affiliate energy trading transactions by AEP in ERCOT.

Virginia Attorney General – Analyzed and presented testimony regarding distribution tap line undergrounding program proposed by Dominion Virginia Power Company.

Cities Served by Southwestern Electric Power Company – Analyzed and presented testimony regarding the prudence of the utility's decision to retire the Welsh Unit 2 coal-fired generating unit in conjunction with a litigation settlement agreement with Sierra Club.

Georgia Public Service Commission - Presented testimony before the Georgia Public Service Commission in Docket 3840-U, providing recommendations on nuclear O&M levels for Hatch and Vogtle and recommending that a nuclear performance standard be implemented in the State of Georgia.

Oklahoma Industrial Energy Consumers - Analyzed and presented testimony addressing power production and coal plant dispatch issues in fuel prudence cases involving Oklahoma Gas and Electric Company.

Georgia Public Service Commission - Analyzed and provided recommendations regarding the reasonableness of nuclear O&M costs, fossil O&M costs and coal inventory levels reported in GPC's 1990 Surveillance Filing.

City of Houston - Analyzed and presented comments on various legislative proposals impacting retail electric and gas utility operations and rates in Texas.

New York Public Service Commission - Conducted inter-company statistical benchmarking analysis of Rochester Gas & Electric Company to provide the New York Public Service Commission with guidance in determining areas which should be reviewed in detailed management audit of the company.

Virginia Attorney General – Analyzed and presented testimony regarding an accelerated vegetation management program and rider proposed by Appalachian Power Company.

Oklahoma Attorney General – Analyzed and presented testimony regarding fuel and purchased power, depreciation and other expense items in Oklahoma Gas & Electric Company's 2001 rate case before the Oklahoma Corporation Commission.

City of Houston - Analyzed and presented testimony regarding fossil plant O&M expense levels in Houston Lighting & Power Company's rate case before the Public Utility Commission of Texas.

City of El Paso - Analyzed and presented testimony regarding regulatory and technical issues related to the Central & Southwest/El Paso Electric Company merger and rate proceedings before the PUCT, including analysis of merger synergy studies, fossil O&M and purchased power margins.

Residential Ratepayer Consortium - Analyzed Fermi 2 replacement power and operating performance issues in fuel reconciliation proceedings for Detroit Edison Company before the Michigan Public Service Commission.

Residential Ratepayer Consortium - Analyzed and prepared testimony addressing coal plant outage rate projections in the Consumer's Power Company fuel proceeding before the Michigan Public Service Commission.

City of El Paso - Analyzed and developed testimony regarding Palo Verde operations and maintenance expenses in El Paso Electric Company's 1991 rate case before the Public Utility Commission of Texas.

City of Houston - Analyzed and developed testimony regarding the operations and maintenance expenses and performance standards for the South Texas Nuclear Project, and operations and maintenance expenses for the Limestone and Parish coal-fired power plants in HL&P's 1991 rate case before the PUCT.

City of El Paso - Analyzed and developed testimony regarding Palo Verde operations and maintenance expenses in El Paso Electric Company's 1990 rate case before the Public Utility Commission of Texas. Recommendations were adopted.

Energy Planning and Procurement Services

Virginia Attorney General – Review and provide comments or testimony regarding annual integrated resource plan filings made by Dominion Virginia Power and Appalachian Power Company.

Dell Computer Corporation – Negotiated retail power supply agreement for Dell's Round Rock, Texas facilities producing annual savings in excess of $2 million.

Texas Association of School Boards Electric Aggregation Program – Serve as TASB's consultant in the development, marketing and administration of a retail electric aggregation program consisting of 2,500 Texas schools with a total load of over 300 MW. Program produced annual savings of more than $30 million in its first year.

Oklahoma Industrial Energy Consumers - Analyzed and drafted comments addressing integrated resource plan filings by Public Service Company of Oklahoma and Oklahoma Gas and Electric Company.

S.C. Johnson - Analyzed and presented testimony addressing Wisconsin Electric Power Company's $4.1 billion CPCN application to construct three coal-fired generating units in southeast Wisconsin.

Oklahoma Industrial Energy Consumers - Analyzed wind energy project ownership proposals by Oklahoma Gas and Electric Company and presented testimony addressing project economics and operational impacts.

City of Chicago, Illinois Attorney General, Illinois Citizens' Utility Board - Analyzed Commonwealth Edison's proposed divestiture of the Kincaid and State Line power plants to SEI and Dominion Resources.

Georgia Public Service Commission - Analyzed and presented testimony on Georgia Power Company's integrated resource plan in a certification proceeding for an eight unit, 640 MW combustion turbine facility.

South Dakota Public Service Commission - Evaluated integrated resource plan and power plant certification filing of Black Hills Power & Light Company.

Shell Leasing Co. - Evaluated market value of 540 MW western coal-fired power plant.

Community Energy Electric Aggregation Program – Served as Community Energy's consultant in the development, marketing and start-up of a retail electric aggregation program consisting of major charitable organizations and their donors in Texas.

Austin Energy – Conducted competitive solicitation for peaking capacity. Developed request for proposal, administered solicitation and evaluated bids.

Austin Energy - Provided technical assistance in the evaluation of the economic viability of the

City of Austin's ownership interest in the South Texas Project.

Austin Energy - Assisted with regional production cost modeling analysis to assess production cost savings associated with various public power merger and power pool alternatives.

Sam Rayburn G&T Electric Cooperative - Conducted competitive solicitation for peaking capacity. Developed request for proposal, administered solicitation and evaluated bids.

Rio Grande Electric Cooperative, Inc. - Directed preparation of power supply solicitation and conducted economic and technical analysis of offers.

Virginia Attorney General – Review and provide comments or testimony regarding annual demand-side management program programs and rider proposals made by Dominion Virginia Power and Appalachian Power Company.

Austin Energy – Conducted modeling to assess potential costs and benefits of a municipal power pool in Texas.

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Electric Restructuring Analyses

Electric Power Research Institute - Evaluated regional resource planning and power market dispatch impacts on rail transportation and coal supply procurement strategies and costs.

Arkansas House of Representatives – Critiqued proposed electric restructuring legislation and identified suggested amendments to provide increased protections for small consumers.

Virginia Legislative Committee on Electric Utility Restructuring – Presented report on status of stranded cost recovery for Virginia's electric utilities.

Georgia Public Service Commission – Developed models and a modeling process for preparing initial estimates of stranded costs for major electric utilities serving the state of Georgia.

City of Houston – Evaluated and recommended adjustments to Reliant Energy's stranded cost proposal before the Public Utility Commission of Texas.

Oklahoma Attorney General – Evaluated and advised the Attorney General on technical, economic and regulatory policy issues arising from various electric restructuring proposals considered by the Oklahoma Electric Restructuring Advisory Committee.

State of Hawaii Department of Business, Economics and Tourism – Evaluated electric restructuring proposals and developed models to assess the potential savings from deregulation of the Oahu power market.

Virginia Attorney General - Served as the Attorney General's consultant and expert witness in the evaluation of electric restructuring legislation, restructuring rulemakings and utility proposals addressing retail pilot programs, stranded costs, rate unbundling, functional separation plans, and competitive metering.

Western Public Power Producers, Inc. - Evaluated operational, cost and regional competitive impacts of the proposed merger of Southwestern Public Service Company and Public Service Company of Colorado.

Iowa Department of Justice, Consumer Advocate Division - Analyzed stranded investment and fuel recover issues resulting from a market-based pricing proposal submitted by MidAmerican Energy Company.

Cullen Weston Pines & Bach/Citizens' Utility Board - Evaluated estimated costs and benefits of the proposed merger of Wisconsin Energy Corporation and Northern States Power Company (Primergy).

City of El Paso - Evaluated merger synergies and plant valuation issues related to the proposed acquisition and merger of El Paso Electric Company and Central & Southwest Company.

Rio Grande Electric Cooperative, Inc. - Analyzed stranded generation investment issues for Central Power & Light Company.

Power Plant Management

City of Austin Electric Utility Department - Analyzed the 1994 Operating Budget for the South Texas Nuclear Project (STNP) and assisted in the development of long-term performance and expense projections and divestiture strategies for Austin's ownership interest in the STNP.

City of Austin Electric Utility Department - Analyzed and provided recommendations regarding the 1991 capital and O&M budgets for the South Texas Nuclear Project.

Sam Rayburn G&T Electric Cooperative - Developed and conducted operational monitoring program relative to minority owner's interest in Nelson 6 Coal Station operated by Gulf States Utilities.

KAMO Electric Cooperative, City of Brownsville and Oklahoma Municipal Power Agency - Directed an operational audit of the Oklaunion coal-fired power plant.

Sam Rayburn G&T Electric Cooperative - Conducted a management/technical assessment of the Big Cajun II coal-fired power plant in conjunction with ownership feasibility studies for the project.

Kamo Electric Power Cooperative - Developed and conducted operational monitoring program for client's minority interest in GRDA Unit 2 Coal Fired Station.

Northeast Texas Electric Cooperative - Developed and conducted operational monitoring program concerning NTEC's interest in Pirkey Coal Station operated by Southwestern Electric Power Company and Dolet Hills Station operated by Central Louisiana Electric Company.

Corn Belt Electric Cooperative/Central Iowa Power Cooperative - Perform operational monitoring and budget analysis on behalf of co-owners of the Duane Arnold Energy Center.

PRESENTATIONS

Quantifying Impacts of Electric Restructuring: Dynamic Analysis of Power Markets, 1997 NARUC Winter Meetings, Committee on Finance and Technology.

Quantifying Costs and Benefits of Electric Utility Deregulation: Dynamic Analysis of

Regional Power Markets, International Association for Energy Economics, 1996 Annual North American Conference.

EX. SN-2

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00258
Interrogatories and Requests for the Production
of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 2
To Appalachian Power Company

Interrogatory OAG 2-012:

Please indicate whether the Amos and Mountaineer plant analyses presented in APCO witness Martin's direct testimony considered the impacts of renewable resource additions and existing generating unit retirements mandated by the Virginia Clean Economy Act ("VCEA") on system capacity requirements and energy costs. If not, provide the results of any analyses conducted by APCo that evaluate whether the proposed CCR and ELG investments and continued operations of the plants until 2040 is economically justified with consideration of VCEA impacts.

Response OAG 2-012:

Company witness Martin's Case 1 analysis, which is the case in which both Amos and Mountaineer operate through 2040, did include the impacts on system capacity requirements and energy costs of 3,650 MW of combined wind ad solar additions over the period 2021-2050 which would be expected to count towards VCEA compliance. In addition, witness Martin's analysis also considered the impacts on APCo capacity requirements and PJM's capacity market of higher levels of renewable penetration projected across the PJM region which could be expected to result from state mandates like the VCEA. This was done through his use of PJM's proposed Effective Load Carrying Capacity (ELCC) method of determining how much capacity credit the proposed VCEA resources (and renewable resources in general) would receive through time. PJM did assume increasing levels of renewable penetration in its ELCC analysis, resulting in declining capacity credit and thus higher capacity related costs as time passes.
Also see the Company's response to OAG 2-13.

The foregoing response is made by James F. Martin, Dir Resource Planning Strategy, on behalf of Appalachian Power Company.

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COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00258
Interrogatories and Requests for the Production
of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 2
To Appalachian Power Company

Interrogatory OAG 2-013:

Please indicate whether the commodity price forecasts underlying the Amos and Mountaineer plant analyses presented in APCo witness Martin's direct testimony considered the impacts of renewable resource additions and existing generating unit retirements mandated by the VCEA on PJM capacity and energy prices. If not, provide the results of any analyses conducted by APCo that evaluate whether the proposed CCR and ELG investments and continued operations of the plants until 2040 is economically justified with consideration of VCEA impacts.

Response OAG 2-013:

See the Company's response to OAG 2-12. The Companies' EIA-Based Fundamentals Forecast did not directly consider any impact of the VCEA, however those EIA forecasts did assume increasing levels of renewable penetration across the PJM region as a whole. No subsequent analysis has been prepared.

The foregoing response is made by James F. Martin, Dir Resource Planning Strategy, on behalf of Appalachian Power Company.

EX. SN-3

Exhibit SN-3

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00258
Interrogatories and Requests for the Production of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 2
To Appalachian Power Company

Interrogatory OAG 2-027:

Please explain how the analyses of Amos and Mountaineer compliance options presented in APCo witness Martin's testimony consider the potential impact of increased coal-plant O&M costs and capital expenditures due to potential future environmental regulations.

Response OAG 2-027:

Company witness Martin did not prepare scenarios involving changes to O&M and capital resulting from future potential environmental regulations, other than the costs of the CCR and ELG regulations which are being considered in this analysis.

The foregoing response is made by James F. Martin, Dir Resource Planning Strategy, on behalf of Appalachian Power Company.

EX. SN-4

Exhibit SN-4

APCo Exhibit No. ___
Witness: JFM
Schedule 46, Section 2, Statement 1
Page 1 of 16

Appalachian Power Company
Amos and Mountaineer CCR& ELG Analysis - Summary of NPV Differences by Time Period

		2020 EIA Base with Carbon Commodity Price Forecast									
		APCO NPV Revenue Requirements ($ Millions)					NPV of 2028 Retirement Net Cost/(Savings) versus Continued Operation Through 2040				
		2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period	2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period
Case 1	Amos + Mountaineer CCR & ELG	5,233	7,251	4,210	3,884	20,578	-		-	-	-
Case 2	Amos CCR + Mountaineer CCR&ELG	5,175	7,681	4,038	3,859	20,754	(57)	430	(172)	(24)	176
Case 3	Amos + Mountaineer CCR Only	5,167	7,986	3,954	3,844	20,951	(65)	735	(256)	(40)	374

		2020 EIA Base without Carbon Commodity Price Forecast									
		APCO NPV Revenue Requirements ($ Millions)					NPV of 2028 Retirement Net Cost/(Savings) versus Continued Operation Through 2040				
		2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period	2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period
Case 1	Amos + Mountaineer CCR & ELG	5,215	5,883	3,783	3,554	18,435	-		-	-	-
Case 2	Amos CCR + Mountaineer CCR&ELG	5,167	6,438	3,611	3,514	18,730	(48)	555	(171)	(40)	295
Case 3	Amos + Mountaineer CCR Only	5,140	6,876	3,539	3,501	19,057	(74)	993	(243)	(53)	622

		2020 EIA Low Band without Carbon Commodity Price Forecast									
		APCO NPV Revenue Requirements ($ Millions)					NPV of 2028 Retirement Net Cost/(Savings) versus Continued Operation Through 2040				
		2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period	2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period
Case 1	Amos + Mountaineer CCR & ELG	4,918	5,450	3,463	3,257	17,088	-		-	-	-
Case 2	Amos CCR + Mountaineer CCR&ELG	4,867	5,974	3,298	3,194	17,333	(51)	524	(165)	(63)	245
Case 3	Amos + Mountaineer CCR Only	4,848	6,294	3,214	3,212	17,569	(70)	844	(249)	(45)	480

EX. SN-5

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COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00015
Interrogatories and Requests for the Production of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 9
To Appalachian Power Company

Interrogatory OAG 9-198:

Provide APCo's economic analyses supporting the assumed retirement dates for the Amos and Mitchell coal-fired generating units.

Response OAG 9-198:

See the Company's response to Staff 1-025, for the requested information for the Amos plant. Mitchell generating units are not owned or operated by the Company.

The foregoing response is made by Debra L. Osborne, VP Generating Assets APCO/KY, on behalf of Appalachian Power Company.

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00015
Interrogatories and Requests for the Production
of Documents by the STAFF OF THE STATE CORPORATION COMMISSION
Staff Set 1
To Appalachian Power Company

Interrogatory Staff 1-025:

Please refer to Schedule 2, page 8 of Company witness Cash's testimony. Provide a detailed discussion of the reasons, beyond the fact that the proposed retirement years for coal generating plants are consistent with the retirement years assumed in the depreciation study from Case No. PUE-2011-00037, for the expected retirement years of:
(a) 2040 for Mountaineer Unit 1;
(b) 2032 for Amos Units 1 and 2;
(c) 2033 for Amos Unit 3; and
(d) 2025 for Clinch River Units 1 and 2.

Response Staff 1-025:

The Company's scheduled retirement dates are not static and have changed over time, and will likely change in the future, as circumstances warrant. As a general matter, depending upon the type of generating facility, scheduled retirement dates are driven by one or more factors.
a)-c) APCo's Mountaineer Plant and Amos Units 1-3 are super-critical coal-fired generating units. Each will have operated approximately 60 years by their scheduled retirement dates, which are used for planning and depreciation purposes. APCo's current scheduled retirement dates for its coal-fired units are based upon a combination of the following factors: the Company's engineering judgment and operating experience regarding the physical condition and the expected useful life of major plant components; the cost to repair or replace major components at the time of failure; market prices for energy related to such things as natural gas prices; and the possible impact of public policy decisions such as environmental regulations and standards related to renewable generation.
d) Clinch Units 1 and 2 were originally placed into service as coal-fired units in 1958, followed by conversion to natural gas-fired operation in early 2016. The engineering design basis used for the conceptual design of the natural gas conversion project at the Clinch River Plant was a 10-year post gas conversion operating life. A high level evaluation of the existing equipment determined that this service 12qlife was achievable especially considering the existing predictive and preventive maintenance practices used at the site and the projected capacity factors of the units after the conversion. Since that time, routine assessments of the equipment at the facility have confirmed this conclusion.

The foregoing response is made by Debra L. Osborne, Title: VP Generating Assets APCO/KY, on behalf of Appalachian Power Company.

EX. SN-6

Exhibit SN-6

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00258
Interrogatories and Requests for the Production
of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 2
To Appalachian Power Company

<u>Interrogatory OAG 2-009:</u>

Please identify any significant changes since Case No. PUR-2020-00015 that have increased the forecasted economic value of continued operations of the Amos coal units and thereby justify continuing to operate the units until 2040 rather than retiring the units in 2032 and 2033?

<u>Response OAG 2-009:</u>

While there have been no significant changes that have increased the forecasted economic value since Case. No. PUR-2020-00015, that does not mean the Amos coal units cannot physically continue to operate until 2040.

The foregoing response is made by James F. Martin, Dir Resource Planning Strategy, on behalf of Appalachian Power Company.

EX. SN-7

Adjustment to Amos Compliance Project Depreciation Expense ($1000s)

			Source
1	Requested Amost Depreciation	$566	Sch 46, Sec 3, Stmt 1
2	Proposed Depreciation Rate	9.52%	Ross, p10, 10.5yrs
3	Adjusted Depreciation Rate	5.71%	Ross, p10, 17.5yrs
	Adjusted Depreciation Rate	$227	Ln1 - (Ln3/Ln2 x Ln1)

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APCo Exhibit No. ___
Witness: JBS
Schedule 46
Section 3, Statement 1
Page 2 of 2

Appalachian Power Company
Case No. PUR-2020-00258
Environmental RAC (E-RAC)
Schedule 46, Section 3, Statement 1
Revenue Requirement- Amounts in $000s
For the Year Beginning October 1,2021

Line No.		Amos Capital Project	Mountaineer Capital Project	O & M Compliance Expenses
1	Average Rate Base	$ 31,101	$ 16,485	$ 8,100
2	Weighted Average Cost of Capital	7.072%	7.072%	7.072%
3	NOI	$ 2,200	$ 1,166	$ 573
	Less Interest Expense on Debt			
4	Total Weighted Average Cost of Debt	2.444%	2.444%	2.444%
5	Average Rate Base	$ 31,101	$ 16,485	$ 8,100
6	Revenue Requirement-Interest Expense on Debt	$ 760	$ 403	$ 198
7	Net Income	$ 1,440	$ 763	$ 375
8	Income Tax Gross-Up Factor	75.61%	75.61%	75.61%
9	Revenue Requirement-Net Income Including Taxes	$ 1,904	$ 1,009	$ 496
10	Revenue Requirement-Financing Costs	$ 2,664	$ 1,412	$ 694
	Operating Expenses			
11	Total Rate Year Expenses	$ -	$ -	$ 9,257
12	Pre-RAC Deferred Expenses			$ 16,199
13	Depreciation Expense	$ 566		
15	Revenue Requirement-Operating Expenses	$ 566	$ -	$ 25,456
	Revenue Requirement Per Projected Cost Recovery Factor	$ 3,230	$ 1,412	$ 26,149

Redline Compare of 4.9.21 Filing with 4.22.21 Errata Filing

Summary of Direct Testimony of Scott Norwood

Mr. Norwood's testimony addresses the reasonableness of APCo's proposal to invest approximately $250 million for environmental compliance projects at the Company's Amos and Mountaineer coal-fired plants to meet requirements of the EPA's CCR and ELG rules, as well as the reasonableness of the revenue requirement for these investments that the Company proposes to recover through its proposed E-RAC mechanism. My primary findings and recommendations on these issues are as follows:

1) APCo's PLEXOS analysis supporting the Company's proposed $250 million investment for CCR and ELG compliance at the Amos and Mountaineer plants fails to explicitly consider impacts of the Virginia Clean Economy Act ("VCEA") and the risk of potential compliance cost increases due to future environmental regulations. The selected Case 1 analysis also assumes a 2040 retirement date for the Amos units which is unjustified and inconsistent with the 2032/2033 retirement dates for the Amos units supported by the Company in its 2020 Triennial Review Case. These flaws serve to unreasonably inflate the forecasted benefits of the Company's selected Case 1 over other compliance options that were evaluated.

2) Even with the flaws in APCo's PLEXOS analysis, the forecasted benefits of the Case 1 plan are less than 0.85% of total forecasted costs over the 30-plus year study period, when compared to forecasted costs of the next lowest cost option. This 0.85% forecasted benefit is insignificant given the uncertainty inherent in utility production cost analyses over such a long period of time, and therefore does not conclusively demonstrate that the Company's proposed $250 million investment for CCR and ELG compliance projects at the Amos and Mountaineer plants is justified.

3) APCo's selected compliance Case 1 is much riskier than the other two compliance cases evaluated by APCo, considering that it would involve the highest level of fixed investment and assumes that the Amos units would operate until 2040, without incurring significant additional investment for environmental 1 compliance or for repair of major plant components.

4) APCo's requested depreciation expense for proposed compliance investments for the Amos coal units is based on a 9.52% depreciation rate that assumes the Amos units are retired in 2033; however, the Company's economic analysis supporting the Amos compliance projects assume that the units do not retire until 2040. This inconsistency in assumed retirement dates results unreasonably overstates depreciation expense included in APCo's E-RAC revenue requirement by approximately $227,000. For the above reasons, I do not recommend that the Commission approve APCo's request for approval and cost recovery for the $250 million of capital investment and related O&M costs to implement CCR and ELG compliance projects at the Amos and Mountaineer plant as proposed under Case 1. If the Commission approves APCo's proposed compliance investment, the Company's requested E-RAC revenue requirement should be reduced by approximately $227,000 to properly reflect the 2040 retirement date assumed by the Company to justify the Amos and Mountaineer compliance investments.

COMMONWEALTH OF VIRGINIA

STATE CORPORATION

COMMISSION

PETITION OF	)	
	)	
APPALACHIAN POWER COMPANY	)	
	)	
For approval of a rate adjustment clause,	)	**CASE NO. PUR-2020-00258**
the E-RAC, for costs to comply with state	)	
and federal environmental regulations pursuant	)	
to § 56-585.1 A 5 e of the Code of Virginia	)	

DIRECT TESTIMONY

OF

SCOTT NORWOOD

ON BEHALF OF

THE OFFICE OF THE ATTORNEY GENERAL

DIVISION OF CONSUMER COUNSEL

APRIL 9, 2021

CASE NO. PUR-2020-00258

DIRECT TESTIMONY OF SCOTT NORWOOD

TABLE OF CONTENTS

EXHIBITS

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Scott Norwood. I am President of Norwood Energy Consulting, L.L.C. My business address is P.O. Box 30197, Austin, Texas 78755-3197.

Q. WHAT IS YOUR OCCUPATION?

A. I am an energy consultant specializing in the areas of electric utility regulation, resource planning, and energy procurement.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I am an electrical engineer with approximately 40 years of experience in the electric utility industry. I began my career as a power plant engineer for the City of Austin's Electric Utility Department where I was responsible for electrical maintenance and design projects for the City's three gas-fired power plants. In January 1984, I joined the staff of the Public Utility Commission of Texas, where I was responsible for addressing resource planning, fuel, and purchased power cost issues in electric rate and plant certification proceedings before the Texas Commission. Since 1986 I have provided utility regulatory consulting, resource planning, and power procurement services to public utilities, electric consumers, industrial interests, municipalities, and state government clients. I have testified in over 200 utility regulatory proceedings over the last 20 years, before state regulatory commissions in Alaska, Arkansas, Florida, Georgia, Illinois, Iowa, Kentucky, Louisiana, Michigan, Missouri, New Jersey, Ohio, Oklahoma, Texas, Virginia, Washington, and Wisconsin.[1]

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS CASE?

A. I am testifying on behalf of the Office of the Attorney General, Division of Consumer Counsel ("Consumer Counsel").

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE STATE CORPORATION COMMISSION?

A. Yes. I have testified on behalf of Consumer Counsel in numerous past regulatory proceedings before the Virginia State Corporation Commission ("Commission"), including cases that involved electric restructuring, base rate, fuel recovery, power plant certification, renewable energy acquisition proposals, demand-side management, and major distribution reliability projects. I have testified on behalf of Consumer Counsel in many past cases involving Appalachian Power Company ("APCo" or "Company"), including the Company's 2020 Triennial Review proceeding and several other past APCo base rate cases, a case involving the Company's acquisition of Ohio Power Company's 867 MW ownership share of Amos Unit 3, fuel factor proceedings, and other matters relevant to the issues addressed by my testimony in this case. I have also testified in regulatory proceedings involving other AEP affiliates of APCo, including Public Service Company of Oklahoma ("PSO"), Southwestern Electric and Power Company ("SWEPCO"), AEP Texas North Company and AEP Texas Central Company.

[1] See Exhibit SN-1 for additional details on my background and experience.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to present my findings and recommendations regarding: the reasonableness of APCo's request for approval of a rate adjustment clause ("the E-RAC") to recover capital investments and operations and maintenance ("O&M") expenses that are necessary to comply with state and federal environmental regulations pursuant to § 56-585.1 A 5 (e) of the Code of Virginia ("the E-RAC Statute"). More specifically, my testimony focuses on the reasonableness of APCo's proposed capital investments to meet regulations of the United States Environmental Protection Agency ("EPA") for disposal of coal combustion residuals ("CCR Rule") and to meet requirements of the EPA's Steam Electric Effluent Limitations Guidelines ("ELG Rule"). My testimony also addresses the inconsistency of APCo's proposal to recover depreciation expense for proposed environmental compliance investments for the Amos coal-fired units based on depreciation rates that assume retirement of the units in 2033, when the Company's economic analysis supporting the Amos compliance investments assumes the Amos units would not retire until 2040.

Q. HAVE YOU PREPARED ANY EXHIBITS TO SUPPORT YOUR TESTIMONY?

A. Yes. I have prepared 7 exhibits, which are attached to my testimony.

II. SUMMARY OF TESTIMONY

Q. PLEASE SUMMARIZE YOUR TESTIMONY AND RECOMMENDATIONS.

A. My testimony addresses the reasonableness of APCo's proposal to invest approximately $250 million for environmental compliance projects at the Company's Amos and

Mountaineer coal-fired plants to meet requirements of the EPA's CCR and ELG rules, as well as the reasonableness of the revenue requirement for these investments that the Company proposes to recover through its proposed E-RAC mechanism. My primary findings and recommendations on these issues are as follows:

1) APCo's PLEXOS analysis supporting the Company's proposed $250 million investment for CCR and ELG compliance at the Amos and Mountaineer plants fails to explicitly consider impacts of the Virginia Clean Economy Act ("VCEA") and the risk of potential compliance cost increases due to future environmental regulations. The selected Case 1 analysis also assumes a 2040 retirement date for the Amos units which is unjustified and inconsistent with the 2032/2033 retirement dates for the Amos units supported by the Company in its 2020 Triennial Review Case. These flaws serve to unreasonably inflate the forecasted benefits of the Company's selected Case 1 over other compliance options that were evaluated.

2) Even with the flaws in APCo's PLEXOS analysis, the forecasted benefits of the Case 1 plan are less than 0.85% of total forecasted costs over the 30-plus year study period, when compared to forecasted costs of the next lowest cost option. This 0.85% forecasted benefit is insignificant given the uncertainty inherent in utility production cost analyses over such a long period of time, and therefore does not conclusively demonstrate that the Company's proposed $250 million investment for CCR and ELG compliance projects at the Amos and Mountaineer plants is justified.

3) APCo's selected compliance Case 1 is much riskier than the other two compliance cases evaluated by APCo, considering that it would involve the highest level of fixed investment and assumes that the Amos units would operate until 2040, without

incurring significant additional investment for environmental compliance or for repair of major plant components.

4) APCo's requested depreciation expense for proposed compliance investments for the Amos coal units is based on a 9.52% depreciation rate that assumes the Amos units are retired in 2033; however, the Company's economic analysis supporting the Amos compliance projects assume that the units do not retire until 2040. This inconsistency in assumed retirement dates results unreasonably overstates depreciation expense included in APCo's E-RAC revenue requirement by approximately $227,000.

For the above reasons, I do not recommend that the Commission approve APCo's request for approval and cost recovery for the $250 million of capital investment and related O&M costs to implement CCR and ELG compliance projects at the Amos and Mountaineer plant as proposed under Case 1. If the Commission approves APCo's proposed compliance investment, the Company's requested E-RAC revenue requirement should be reduced by approximately $227,000 to properly reflect the 2040 retirement date assumed by the Company to justify the Amos and Mountaineer compliance investments.

III. APCO'S E-RAC PROPOSAL

Q. WHAT IS THE AGE AND CAPACITY RATINGS OF APCO'S AMOS AND MOUNTAINEER COAL UNITS?

A. The capacity ratings, commercial operation dates and scheduled retirement dates for the Amos and Mountaineer coal units are summarized below in Table 1.

Table 1

Amos and Mountaineer Capacity, Commercial Operation and Retirement Dates[2]

Plant/Unit	Rated Capacity MW	Commercial Operation Year	Retirement Year	Age at Retirement
Amos 1	800	1971	2032	61
Amos 2	800	1972	2032	60
Amost 3	1,330	1973	2033	60
Mountaineer 1	1,320	1980	2040	60
Total	4,250			

Q. **PLEASE DESCRIBE APCO'S PROPOSED INVESTMENTS FOR COMPLIANCE WITH THE EPA'S CCR AND ELG REGULATIONS AT THE COMPANY'S AMOS AND MOUNTAINEER COAL-FIRED PLANTS.**

A. APCo proposes to install: 1) dry ash handling systems; 2) new lined wastewater ponds, and 3) water biological treatment systems with ultrafiltration to meet CCR and ELG regulations at the Amos and Mountaineer plants.[3]

Q. **WHAT ARE THE ESTIMATED CAPITAL COSTS FOR THESE COMPLIANCE PROJECTS?**

A. The estimated capital costs, including asset retirement obligations, total approximately $250 million, as summarized in Table 2:

[2] Source is APCo's response to OAG 2-4 in Case No. PUR-2020-00015.

[3] See APCo witness Ross's direct testimony, page 4.

Table 2
Amos and Mountaineer CCR and ELG Capital Costs ($Millions)[4]

	Amos 1-3	Mountaineer	Total
CCR	$72.7	$52.1	$124.8
ELG	$104.4	$20.8	$125.2
Total	$177.1	$72.9	$250.0

Q. WHAT ARE THE SCHEDULED IN-SERVICE DATES OF THE AMOS AND MOUNTAINEER CCR AND ELG INVESTMENTS?

A. The scheduled in-service dates for the Amos and Mountaineer CCR and ELG projects are summarized in Table 3 below:

Table 3
Scheduled In-Service Dates for CCR and ELG Projects[5]

	Amos	Mountaineer
Dry Ash Handling Systems	December 2022	May 2022
Lined Wastewater Ponds	October 2023	December 2023
Water Treatment Systems	December 2023	December 2022

Q. WHAT IS THE ANNUAL REVENUE REQUIREMENT FOR THESE PROJECTS THAT APCO SEEKS TO RECOVER THROUGH ITS PROPOSED E-RAC?

A. APCo requests recovery of $31.6 million for compliance capital and O&M costs of the proposed CCR and ELG investments during the Rate Year, through the Company's

4 Source is APCo witness Martin's direct testimony, page 15.

5 See APCo witness Ross's direct testimony, page 4.

proposed E-RAC mechanism. [6]

Q. WHAT ARE THE KEY QUESTIONS TO BE ANSWERED IN DETERMINING WHETHER APCO'S REQUEST FOR RECOVERY OF CCR AND ELG INVESTMENTS SHOULD BE APPROVED?

A. The key questions which must be addressed in evaluating APCo's request for approval and cost recovery for $250 million in CCR and ELG compliance investments at the Amos and Mountaineer plants are:

1) Are the proposed compliance investments reasonable and necessary?

2) Did APCo properly consider available alternatives to the proposed CCR and ELG investments?

3) Is APCo's proposed E-RAC revenue requirement reasonably calculated?

IV. REASONABLENESS OF PROPOSED CCR AND ELG INVESTMENTS

Q. HOW DID APCO EVALUATE WHETHER THE PROPOSED CCR AND ELG INVESTMENTS AT THE AMOS AND MOUNTAINEER PLANTS ARE REASONABLE AND NECESSARY?

A. APCo used the PLEXOS production cost simulation model to evaluate the costs of three compliance scenarios for the Amos and Mountaineer plants over a range of three commodity price forecasts. The three compliance scenarios and commodity price sensitivities evaluated by APCo are summarized in Table 4 below.

[6] See APCo's Petition, page 5. The Rate Year is October 1, 2021 through September 30, 2022.

Table 4
APCo Scenarios for Analysis of Amos and Mountaineer Compliance Options[7]

			NPV Rev. Reqt. Costs (Savings) vs Case 1 ($Millions)		
Cases	Retirement Dates	Capital Investment	Base with Carbon	Base No Carbon	Low No Carbon
Case 1: CCR/ELG Both Plants	Both Plants in 2040	$250			
Case 2: Amos CCR; Mountaineer CCR&ELG	Amos 2028; Mountaineer 2040	$146	$176	$295	$245
Case 3: CCR only Both Plants	Both in 2028	$125	$374	$622	$480

Q. **WHICH COMPLIANCE OPTION DID APCO SELECT BASED ON ITS PLEXOS ANALYSIS?**

A. APCo selected Case 1, which provides for $250 million in capital investment to install CCR and ELG projects and assumes that Amos and Mountaineer will retire in 2040.[8]

Q. **DOES APCO'S PLEXOS ANALYSIS DEMONSTRATE THAT CASE 1 IS THE LOWEST REASONABLE COST ALTERNATIVE FOR COMPLIANCE WITH OTHER EXISTING OR FUTURE ENVIRONMENTAL REGULATIONS?**

A. No. For example, APCo's PLEXOS analysis did not explicitly evaluate the cost of a resource plan that is compliant with the VCEA in any cases, and only indirectly evaluated VCEA impacts in Case 1.[9] This omission is a major deficiency in APCo's PLEXOS analysis, since the VCEA mandates that the Company develop and propose for approval the acquisition of at least 600 MW of renewable generation by 2030. In addition, over the longer planning horizon, the Company must plan to comply with a Renewable Portfolio Standard ("RPS") requirement of zero carbon emissions by 2050. These

[7] See the direct testimony of APCo witness Martin, page 4.

[8] See the direct testimony of APCo witness Martin, page 4.

[9] See Exhibit SN-2, APCo's response to OAG 2-12 and OAG 2-13.

renewable compliance costs will likely alter the level, timing, and costs of replacement energy and capacity on APCo's system, when compared to the amounts included in APCo's PLEXOS Case 1 analysis.

Moreover, beyond the proposed $250 million investment to comply with the CCR and ELG rules, APCo's analysis does not consider costs of compliance with other future environmental regulations that may impact operations of the Amos and Mountaineer plants, or other APCo power plants.[10]

Q. WHY DOES APCO'S FAILURE TO EXPLICITLY EVALUATE COST IMPACTS OF THE VCEA AND POTENTIAL FUTURE REGULATIONS UNREASONABLY BIAS THE PLEXOS RESULTS IN FAVOR OF CASE 1?

A. The primary forecasted benefit of Case 1 over other compliance alternatives evaluated by APCo's PLEXOS analysis is the avoided replacement capacity and energy that is expected to result from operating the Amos and Mountaineer units until 2040, rather than retiring the units at an earlier date. But the mandatory RPS Program will likely displace a portion of the capacity that the Company's PLEXOS analysis assumes would have to be procured if the Amos and Mountaineer units were retired early, because the VCEA-mandated requirements exist whether or not the Amos and Mountaineer units are retired. If APCo had properly evaluated the VCEA requirements in all three compliance cases evaluated in its PLEXOS analysis, the relatively small forecasted economic benefit of Case 1 over other compliance options would likely have been even smaller.

Similarly, APCo's failure to consider the risk of higher costs of compliance with future environmental regulations if the Amos and Mountaineer units were operated until

[10] See Exhibit SN-3, APCo's response to OAG 2-27.

2040, unreasonably inflates the forecasted benefits of the selected Case 1 compliance option, which are already small. These flaws in APCo's PLEXOS analysis bias the results in favor of Case 1, and against the "lower investment/earlier retirement" alternatives evaluated in compliance Case 2 and Case 3.

Q. WHY DO YOU CONSIDER THE FORECASTED BENEFITS OF APCO'S PROPOSED CASE 1 TO BE RELATIVELY SMALL?

A. APCo's PLEXOS analysis covers a 30-year study period from 2021 through 2050, plus end effects beyond 2050. As summarized in Table 5, the Company's analysis indicates that the forecasted base case benefit of Case 1 is only 0.85% when compared to the next lowest cost option over the 30+ years covered by the PLEXOS modeling analysis.

Table 5
Forecasted Savings of Case 1 Over Other Compliance Options

	Case 1 Amos + Mount CCR&ELG Both Retire 2040	Case 2 Amos CCR + Mount CCR+ELG Amos Ret 2028	Case 3 Amos +Mount CCR Only Both Retire 2028
EIA Base With Carbon	$20,578	$20,754	$20,951
Change vs Case 1		$176	$373
Case 1 Benefit, %		0.85%	1.78%
EIA Base Without Carbon	$18,435	$18,730	$19,057
Change vs Case 1		$295	$622
Case 1 Benefit, %		1.58%	3.26%
EIA Low without Carbon	$17,088	$17,333	$17,569
Change vs Case 1		$245	$481
Case 1 Benefit, %		1.41%	2.74%

[11] See Exhibit SN-4, APCo's Schedule 46, Section 2, Statement 1.

I believe that a 0.85% forecasted benefit is insignificant considering: 1) the inherent uncertainty in forecasting utility system loads, operations and production costs for a large system over a 30+ study period; and 2) the uncertainty regarding compliance costs associated with future energy policies (such as the VCEA) and environmental regulations that may be implemented due to growing concerns regarding climate change.

Q. **DO YOU HAVE OTHER CONCERNS REGARDING APCO'S PROPOSED CCR/ELG COMPLIANCE PLAN FOR THE AMOS AND MOUNTAINEER COAL UNITS?**

A. Yes. I am concerned that APCo has shifted an excessive amount of risk to its customers by selecting the Case 1 compliance option which is arguably the riskiest option, and requires the highest fixed compliance investment. Again, APCo's selection of Case 1 is based on results of a PLEXOS analysis that is flawed and unduly biased in favor of Case 1, but that still forecasts relatively small benefits for Case 1. Moreover, the forecasted benefits under Case 1 are dependent on the already relatively old Amos and Mountaineer coal units operating until 2040, at which time the Amos units would be approaching 70 years in commercial operations, and Mountaineer would be 60 years old. APCo's strategy with Amos and Mountaineer appears to be inconsistent with industry trends which are moving toward earlier retirement of coal-fired generating units in response to lower market prices for energy and capacity, risks of future environmental compliance costs, and the need to reduce carbon emissions to address climate change.

Q. **IS APCO'S ASSUMPTION THAT THE AMOS UNITS WILL RETIRE IN 2040 CONSISTENT WITH THE POSITION TAKEN IN THE COMPANY'S LAST RATE CASE?**

A. No. In PUR-2020-00015, APCo's 2020 Triennial Review Proceeding, APCo testified in support of accelerating the retirement dates for the Amos coal units from 2040 to 2032 and 2033. Although the Company did not produce economic studies to support these new retirement dates, in response to discovery the Company noted that the 2032 and 2033 retirement dates were based on:

> a combination of engineering judgement and operating experience regarding the physical condition and the expected useful life of major plant components; the cost to repair or replace major components at the time of failure; market prices for energy related to such things as natural gas prices; and the possible impact of public policy decisions such as environmental regulations and standards related to renewable generation.[12]

Q. HAS APCO IDENTIFIED ANY CHANGES SINCE APCO'S TRIENNIAL REVIEW CASE THAT MIGHT JUSTIFY DELAYING THE RETIREMENT OF THE AMOS COAL UNITS FROM 2032 AND 2033 UNTIL 2040, AS IT HAS ASSUMED IN ITS PLEXOS ANALYSIS OF COMPLIANCE CASE 1?

A. No. In fact, APCo admits that there have been no changes in market conditions or other factors that would increase the market value of the Amos units or otherwise justify extending their retirement dates from 2032 and 2033, until 2040. [13]

Q. HOW DOES THE ASSUMED 2040 RETIREMENT DATE FOR THE AMOS UNITS IN APCO'S CASE 1 ANALYSIS IMPACT THE FORECASTED SAVINGS OF THE CASE 1 COMPLIANCE ALTERNATIVE SELECTED BY APCO?

A. As shown in Table 6 below, all of the forecasted savings for Case 1 occur during the 2028-2039 period, during which Case 1 is the only scenario that Amos would operate.

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[12] See Exhibit SN-5.

[13] See Exhibit SN-6, APCo's response to OAG 2-9.

Table 6

Forecasted Benefits/(Costs) of Case 1 vs Cases 2 and 3 by Time Periods

(Cumulative NPV, $Millions)[14]

Case/Scenario	2021-2027	2028-2039	2040-2050	End Effects	Total Study Period
EIA Base With Carbon					
Case 2 vs Case 1	-$57	$430	-$172	-$24	$177
Case 3 vs Case 1	-$65	$735	-$256	-$40	$374
EIA Base Without Carbon					
Case 2 vs Case 1	-$48	$555	-$171	-$40	$296
Case 3 vs Case 1	-$74	$993	-$243	-$53	$623
EIA Low without Carbon					
Case 2 vs Case 1	-$51	$524	-$165	-$63	$245
Case 3 vs Case 1	-$70	$844	-$249	-$45	$480

Q. DO YOU HAVE OTHER CONCERNS WITH APCO'S PLEXOS ANALYSIS OF ENVIRONMENTAL COMPLIANCE INVESTMENTS FOR THE AMOS AND MOUNTAINEER PLANTS?

A. Yes. I am concerned that APCo's PLEXOS analysis did not evaluate a scenario that assumes retirement and replacement of one or more of the Amos or Mountaineer units as an alternative to the $250 million compliance investment it selected under Case 1. APCo's analysis instead assumes CCR and/or ELG investments are made in all three cases that were evaluated. Due to the Company's failure to evaluate any cases that considered retirement and replacement of one or more of the Amos or Mountaineer coal units as an alternative to compliance investments, I cannot conclude with any confidence that Case 1 is the lowest reasonable cost alternative for customers. This is particularly true considering APCo's additional failure to analyze impacts of the VCEA and the risk

[14] See Exhibits SN-7 and SN-4.

that additional compliance costs could be required at Amos and Mountaineer for future environmental regulations if they were operated until 2040 as the Company assumes.

Q. PLEASE SUMMARIZE YOUR FINDINGS REGARDING APCO'S PLEXOS ANALYSIS OF ENVIRONMENTAL COMPLIANCE INVESTMENTS FOR THE AMOS AND MOUNTAINEER COAL UNITS?

A. APCo's PLEXOS analysis is flawed by failing to explicitly consider impacts of the VCEA or the risk of higher compliance costs due to future environmental regulations, and by use of an unjustified 2040 retirement date for the Amos units. These flaws serve to unreasonably inflate the forecasted benefits of Case 1 when compared to other compliance options that were evaluated. Additionally, even with these flaws, the forecasted benefits of the Case 1 plan are small and uncertain, and therefore do not conclusively demonstrate that the Company's proposed $250 million investment for CCR and ELG compliance projects is justified. Moreover, Case 1 is riskier than the other two compliance cases evaluated by APCo, considering that it would involve the highest level of fixed compliance investment and depends on the Amos and Mountaineer units operating reliably and economically until 2040, which is not assured. For these reasons, I cannot recommend that the Commission approve APCo's request for cost recovery for the full $250 million of capital investment and related O&M costs to implement CCR and ELG compliance projects at the Amos and Mountaineer plant as proposed under Case 1.

V. DEPRECIATION RATES FOR AMOS COMPLIANCE INVESTMENTS

Q. WHAT DEPRECIATION RATES IS APCO PROPOSING FOR USE IN DETERMINING THE REVENUE REQUIREMENT FOR CCR AND ELG INVESTMENTS FOR THE AMOS AND MOUNTAINEER COAL UNITS?

A. APCo is proposing that a depreciation rate of 9.52% be applied to determine the E-RAC revenue requirement for the Amos CCR and ELG compliance investments.[15] This proposed depreciation rate for the Amos CCR and ELG investments is based on a remaining life of 10.5 years, which reflects a 2033 retirement date for the Amos units. [16] The Company is proposing a 5.71% depreciation rate for compliance investments at Mountaineer, based on a 2040 retirement date for the unit. [17]

Q. IS IT REASONABLE FOR APCO TO USE A 9.52% DEPRECIATION RATE FOR AMOS COMPLIANCE INVESTMENTS AND A 5.71% RATE FOR MOUNTAINEER COMPLIANCE INVESTMENTS?

A. No. APCo indicates that its proposed 9.52% depreciation rate is based on the estimated 2032 and 2033 retirement dates for the Amos units, underlying the depreciation rates approved by the Commission in the Company's 2020 Triennial Review Case. [18] It is inconsistent to use 2032 and 2033 retirement dates for setting depreciation rates for the Amos compliance investments, when APCo used a 2040 retirement date for the Amos units in the PLEXOS Case 1 analysis, which provides the primary economic justification

[15] See APCo witness Ross's direct testimony, page 10.

[16] Ibid.

[17] Ibid.

[18] See APCo witness Ross's direct testimony, pages 9-10.

for the Company's proposed $177.1 million Amos compliance investment.[19] In fact, APCo has proposed a 5.71% depreciation rate for the Mountaineer compliance investments based on the same 2040 retirement date that was used for the PLEXOS Case 1 analysis that supports the investments.[20] If the Commission approves APCo's $250 million request based upon the assumption that the Amos Plant will operate through 2040, as a matter of consistency, it should consider requiring that the depreciation rates for the Amos and Mountaineer compliance investments also both be based on the same 2040 retirement date.

Q. WHAT WOULD BE THE APPROXIMATE CHANGE IN DEPRECIATION EXPENSE IF THE SAME DEPRECIATION RATE (BASED ON 2040 RETIREMENT) WAS USED FOR THE AMOS AND MOUNTAINEER COMPLIANCE INVESTMENTS?

A. I estimate that applying the same 5.71% depreciation rate to the proposed compliance investments for both the Amos and Mountaineer units would reduce APCo's proposed $31.6 million E-RAC revenue requirement by approximately $227,000, on a Virginia Retail basis.[21]

Q. DOES THAT CONCLUDE YOUR RESPONSIVE TESTIMONY?

A. Yes. However, I reserve the right to present oral surrebuttal testimony at the hearing to respond to any new issues that may be raised by APCo's rebuttal testimony.

[19] As noted earlier in my testimony, the assumption that the Amos units would operate to 2040 only in Case 1, while Amos was assumed to be retired in 2028 in all other cases, was a key factor in economically justifying the Case 1 investments.

[20] See APCo witness Ross's direct testimony, page 10.

[21] See Exhibit SN-7.

EX. SN-1

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SUMMARY

Scott Norwood is an energy consultant with over 37 years of utility industry experience in the areas of regulatory consulting, resource planning and energy procurement. His clients include government agencies, publicly-owned utilities, public service commissions, municipalities and various electric consumer interests. Over the last 15 years Mr. Norwood has presented expert testimony on electric utility ratemaking, resource planning, and electric utility restructuring issues in over 200 regulatory proceedings in Arkansas, Georgia, Iowa, Illinois, Michigan, Missouri, New Jersey, Oklahoma, South Dakota, Texas, Virginia, Washington and Wisconsin.

Prior to founding Norwood Energy Consulting in January of 2004, Mr. Norwood was employed for 18 years by GDS Associates, Inc., a Marietta, Georgia based energy consulting firm. Mr. Norwood was a Principal of GDS and directed the firm's Deregulated Services Department which provided a range of consulting services including merchant plant due diligence studies, deregulated market price forecasts, power supply planning and procurement projects, electric restructuring policy analyses, and studies of power plant dispatch and production costs.

Before joining GDS, Mr. Norwood was employed by the Public Utility Commission of Texas as Manager of Power Plant Engineering from 1984 through 1986. He began his career in 1980 as Staff Electrical Engineer with the City of Austin's Electric Utility Department where he was in charge of electrical maintenance and design projects at three gas-fired power plants.

Mr. Norwood is a graduate of the college of electrical engineering of the University of Texas.

EXPERIENCE

The following summaries are representative of the range of projects conducted by Mr. Norwood over his 30-year consulting career.

Regulatory Consulting

Oklahoma Industrial Energy Consumers - Assisted client with technical and economic analysis of proposed EPA regulations and compliance plans involving control of air emissions and potential conversion of coal-to-gas conversion options.

Cities Served by Southwestern Electric Power Company – Analyzed and presented testimony regarding the prudence of a $1.7 billion coal-fired power plant and related settlement agreements with Sierra Club.

New York Public Service Commission - Conducted inter-company statistical benchmarking analysis of Consolidated Edison Company to provide the New York Public Service Commission with guidance in determining areas that should be reviewed in detailed management audit of the company.

Oklahoma Industrial Energy Consumers - Analyzed and presented testimony on affiliate energy trading transactions by AEP in ERCOT.

Virginia Attorney General – Analyzed and presented testimony regarding distribution tap line undergrounding program proposed by Dominion Virginia Power Company.

Cities Served by Southwestern Electric Power Company – Analyzed and presented testimony regarding the prudence of the utility's decision to retire the Welsh Unit 2 coal-fired generating unit in conjunction with a litigation settlement agreement with Sierra Club.

Georgia Public Service Commission - Presented testimony before the Georgia Public Service Commission in Docket 3840-U, providing recommendations on nuclear O&M levels for Hatch and Vogtle and recommending that a nuclear performance standard be implemented in the State of Georgia.

Oklahoma Industrial Energy Consumers - Analyzed and presented testimony addressing power production and coal plant dispatch issues in fuel prudence cases involving Oklahoma Gas and Electric Company.

Georgia Public Service Commission - Analyzed and provided recommendations regarding the reasonableness of nuclear O&M costs, fossil O&M costs and coal inventory levels reported in GPC's 1990 Surveillance Filing.

City of Houston - Analyzed and presented comments on various legislative proposals impacting retail electric and gas utility operations and rates in Texas.

New York Public Service Commission - Conducted inter-company statistical benchmarking analysis of Rochester Gas & Electric Company to provide the New York Public Service Commission with guidance in determining areas which should be reviewed in detailed management audit of the company.

Virginia Attorney General – Analyzed and presented testimony regarding an accelerated vegetation management program and rider proposed by Appalachian Power Company.

Oklahoma Attorney General – Analyzed and presented testimony regarding fuel and purchased power, depreciation and other expense items in Oklahoma Gas & Electric Company's 2001 rate case before the Oklahoma Corporation Commission.

City of Houston - Analyzed and presented testimony regarding fossil plant O&M expense levels in Houston Lighting & Power Company's rate case before the Public Utility Commission of Texas.

City of El Paso - Analyzed and presented testimony regarding regulatory and technical issues related to the Central & Southwest/El Paso Electric Company merger and rate proceedings before the PUCT, including analysis of merger synergy studies, fossil O&M and purchased power margins.

Residential Ratepayer Consortium - Analyzed Fermi 2 replacement power and operating performance issues in fuel reconciliation proceedings for Detroit Edison Company before the Michigan Public Service Commission.

Residential Ratepayer Consortium - Analyzed and prepared testimony addressing coal plant outage rate projections in the Consumer's Power Company fuel proceeding before the Michigan Public Service Commission.

City of El Paso - Analyzed and developed testimony regarding Palo Verde operations and maintenance expenses in El Paso Electric Company's 1991 rate case before the Public Utility Commission of Texas.

City of Houston - Analyzed and developed testimony regarding the operations and maintenance expenses and performance standards for the South Texas Nuclear Project, and operations and maintenance expenses for the Limestone and Parish coal-fired power plants in HL&P's 1991 rate case before the PUCT.

City of El Paso - Analyzed and developed testimony regarding Palo Verde operations and maintenance expenses in El Paso Electric Company's 1990 rate case before the Public Utility Commission of Texas. Recommendations were adopted.

Energy Planning and Procurement Services

Virginia Attorney General – Review and provide comments or testimony regarding annual integrated resource plan filings made by Dominion Virginia Power and Appalachian Power Company.

Dell Computer Corporation – Negotiated retail power supply agreement for Dell's Round Rock, Texas facilities producing annual savings in excess of $2 million.

Texas Association of School Boards Electric Aggregation Program – Serve as TASB's consultant in the development, marketing and administration of a retail electric aggregation program consisting of 2,500 Texas schools with a total load of over 300 MW. Program produced annual savings of more than $30 million in its first year.

Oklahoma Industrial Energy Consumers - Analyzed and drafted comments addressing integrated resource plan filings by Public Service Company of Oklahoma and Oklahoma Gas and Electric Company.

S.C. Johnson - Analyzed and presented testimony addressing Wisconsin Electric Power Company's $4.1 billion CPCN application to construct three coal-fired generating units in southeast Wisconsin.

Oklahoma Industrial Energy Consumers - Analyzed wind energy project ownership proposals by Oklahoma Gas and Electric Company and presented testimony addressing project economics and operational impacts.

City of Chicago, Illinois Attorney General, Illinois Citizens' Utility Board - Analyzed Commonwealth Edison's proposed divestiture of the Kincaid and State Line power plants to SEI and Dominion Resources.

Georgia Public Service Commission - Analyzed and presented testimony on Georgia Power Company's integrated resource plan in a certification proceeding for an eight unit, 640 MW combustion turbine facility.

South Dakota Public Service Commission - Evaluated integrated resource plan and power plant certification filing of Black Hills Power & Light Company.

Shell Leasing Co. - Evaluated market value of 540 MW western coal-fired power plant.

Community Energy Electric Aggregation Program - Served as Community Energy's consultant in the development, marketing and start-up of a retail electric aggregation program consisting of major charitable organizations and their donors in Texas.

Austin Energy - Conducted competitive solicitation for peaking capacity. Developed request for proposal, administered solicitation and evaluated bids.

Austin Energy - Provided technical assistance in the evaluation of the economic viability of the

City of Austin's ownership interest in the South Texas Project.

Austin Energy - Assisted with regional production cost modeling analysis to assess production cost savings associated with various public power merger and power pool alternatives.

Sam Rayburn G&T Electric Cooperative - Conducted competitive solicitation for peaking capacity. Developed request for proposal, administered solicitation and evaluated bids.

Rio Grande Electric Cooperative, Inc. - Directed preparation of power supply solicitation and conducted economic and technical analysis of offers.

Virginia Attorney General – Review and provide comments or testimony regarding annual demand-side management program programs and rider proposals made by Dominion Virginia Power and Appalachian Power Company.

Austin Energy – Conducted modeling to assess potential costs and benefits of a municipal power pool in Texas.

Electric Restructuring Analyses

Electric Power Research Institute - Evaluated regional resource planning and power market dispatch impacts on rail transportation and coal supply procurement strategies and costs.

Arkansas House of Representatives – Critiqued proposed electric restructuring legislation and identified suggested amendments to provide increased protections for small consumers.

Virginia Legislative Committee on Electric Utility Restructuring – Presented report on status of stranded cost recovery for Virginia's electric utilities.

Georgia Public Service Commission – Developed models and a modeling process for preparing initial estimates of stranded costs for major electric utilities serving the state of Georgia.

City of Houston – Evaluated and recommended adjustments to Reliant Energy's stranded cost proposal before the Public Utility Commission of Texas.

Oklahoma Attorney General – Evaluated and advised the Attorney General on technical, economic and regulatory policy issues arising from various electric restructuring proposals considered by the Oklahoma Electric Restructuring Advisory Committee.

State of Hawaii Department of Business, Economics and Tourism -- Evaluated electric restructuring proposals and developed models to assess the potential savings from deregulation of the Oahu power market.

Virginia Attorney General - Served as the Attorney General's consultant and expert witness in the evaluation of electric restructuring legislation, restructuring rulemakings and utility proposals addressing retail pilot programs, stranded costs, rate unbundling, functional separation plans, and competitive metering.

Western Public Power Producers, Inc. - Evaluated operational, cost and regional competitive impacts of the proposed merger of Southwestern Public Service Company and Public Service Company of Colorado.

Iowa Department of Justice, Consumer Advocate Division - Analyzed stranded investment and fuel recover issues resulting from a market-based pricing proposal submitted by MidAmerican Energy Company.

Cullen Weston Pines & Bach/Citizens' Utility Board - Evaluated estimated costs and benefits of the proposed merger of Wisconsin Energy Corporation and Northern States Power Company (Primergy).

City of El Paso - Evaluated merger synergies and plant valuation issues related to the proposed acquisition and merger of El Paso Electric Company and Central & Southwest Company.

Rio Grande Electric Cooperative, Inc. - Analyzed stranded generation investment issues for Central Power & Light Company.

Power Plant Management

City of Austin Electric Utility Department - Analyzed the 1994 Operating Budget for the South Texas Nuclear Project (STNP) and assisted in the development of long-term performance and expense projections and divestiture strategies for Austin's ownership interest in the STNP.

City of Austin Electric Utility Department - Analyzed and provided recommendations regarding the 1991 capital and O&M budgets for the South Texas Nuclear Project.

Sam Rayburn G&T Electric Cooperative - Developed and conducted operational monitoring program relative to minority owner's interest in Nelson 6 Coal Station operated by Gulf States Utilities.

KAMO Electric Cooperative, City of Brownsville and Oklahoma Municipal Power Agency - Directed an operational audit of the Oklaunion coal-fired power plant.

Sam Rayburn G&T Electric Cooperative - Conducted a management/technical assessment of the Big Cajun II coal-fired power plant in conjunction with ownership feasibility studies for the project.

Kamo Electric Power Cooperative - Developed and conducted operational monitoring program for client's minority interest in GRDA Unit 2 Coal Fired Station.

Northeast Texas Electric Cooperative - Developed and conducted operational monitoring program concerning NTEC's interest in Pirkey Coal Station operated by Southwestern Electric Power Company and Dolet Hills Station operated by Central Louisiana Electric Company.

Corn Belt Electric Cooperative/Central Iowa Power Cooperative - Perform operational monitoring and budget analysis on behalf of co-owners of the Duane Arnold Energy Center.

PRESENTATIONS

Quantifying Impacts of Electric Restructuring: Dynamic Analysis of Power Markets, 1997 NARUC Winter Meetings, Committee on Finance and Technology.

Quantifying Costs and Benefits of Electric Utility Deregulation: Dynamic Analysis of

Regional Power Markets, International Association for Energy Economics, 1996 Annual North American Conference.

EX. SN-2

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00258
Interrogatories and Requests for the Production of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 2
To Appalachian Power Company

Interrogatory OAG 2-012:

Please indicate whether the Amos and Mountaineer plant analyses presented in APCO witness Martin's direct testimony considered the impacts of renewable resource additions and existing generating unit retirements mandated by the Virginia Clean Economy Act ("VCEA") on system capacity requirements and energy costs. If not, provide the results of any analyses conducted by APCo that evaluate whether the proposed CCR and ELG investments and continued operations of the plants until 2040 is economically justified with consideration of VCEA impacts.

Response OAG 2-012:

Company witness Martin's Case 1 analysis, which is the case in which both Amos and Mountaineer operate through 2040, did include the impacts on system capacity requirements and energy costs of 3,650 MW of combined wind ad solar additions over the period 2021-2050 which would be expected to count towards VCEA compliance. In addition, witness Martin's analysis also considered the impacts on APCo capacity requirements and PJM's capacity market of higher levels of renewable penetration projected across the PJM region which could be expected to result from state mandates like the VCEA. This was done through his use of PJM's proposed Effective Load Carrying Capacity (ELCC) method of determining how much capacity credit the proposed VCEA resources (and renewable resources in general) would receive through time. PJM did assume increasing levels of renewable penetration in its ELCC analysis, resulting in declining capacity credit and thus higher capacity related costs as time passes.
Also see the Company's response to OAG 2-13.

The foregoing response is made by James F. Martin, Dir Resource Planning Strategy, on behalf of Appalachian Power Company.

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00258
Interrogatories and Requests for the Production
of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 2
To Appalachian Power Company

Interrogatory OAG 2-013:

Please indicate whether the commodity price forecasts underlying the Amos and Mountaineer plant analyses presented in APCo witness Martin's direct testimony considered the impacts of renewable resource additions and existing generating unit retirements mandated by the VCEA on PJM capacity and energy prices. If not, provide the results of any analyses conducted by APCo that evaluate whether the proposed CCR and ELG investments and continued operations of the plants until 2040 is economically justified with consideration of VCEA impacts.

Response OAG 2-013:

See the Company's response to OAG 2-12. The Companies' EIA-Based Fundamentals Forecast did not directly consider any impact of the VCEA, however those EIA forecasts did assume increasing levels of renewable penetration across the PJM region as a whole. No subsequent analysis has been prepared.

The foregoing response is made by James F. Martin, Dir Resource Planning Strategy, on behalf of Appalachian Power Company.

EX. SN-3

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00258
Interrogatories and Requests for the Production of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 2
To Appalachian Power Company

Interrogatory OAG 2-027:

Please explain how the analyses of Amos and Mountaineer compliance options presented in APCo witness Martin's testimony consider the potential impact of increased coal-plant O&M costs and capital expenditures due to potential future environmental regulations.

Response OAG 2-027:

Company witness Martin did not prepare scenarios involving changes to O&M and capital resulting from future potential environmental regulations, other than the costs of the CCR and ELG regulations which are being considered in this analysis.

The foregoing response is made by James F. Martin, Dir Resource Planning Strategy, on behalf of Appalachian Power Company.

EX. SN-4

Appalachian Power Company

Amos and Mountaineer CCR& ELG Analysis - Summary of NPV Differences by Time Period

2020 EIA Base with Carbon Commodity Price Forecast

		APCO NPV Revenue Requirements ($ Millions)					NPV of 2028 Retirement Net Cost/(Savings) versus Continued Operation Through 2040				
		2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period	2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period
Case 1	Amos + Mountaineer CCR & ELG	5,233	7,251	4,210	3,884	20,578	-		-	-	-
Case 2	Amos CCR + Mountaineer CCR&ELG	5,175	7,681	4,038	3,859	20,754	[illegible]	430	[illegible]	(23)	176
Case 3	Amos + Mountaineer CCR Only	5,167	7,936	3,954	3,844	20,951	[illegible]	735	[illegible]	[illegible]	374

2020 EIA Base without Carbon Commodity Price Forecast

		APCO NPV Revenue Requirements ($ Millions)					NPV of 2028 Retirement Net Cost/(Savings) versus Continued Operation Through 2040				
		2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period	2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period
Case 1	Amos + Mountaineer CCR & ELG	5,215	5,883	3,783	3,554	18,435	-		-	-	-
Case 2	Amos CCR + Mountaineer CCR&ELG	5,167	6,438	3,611	3,514	18,730	(4[illegible])	555	[illegible]	[illegible]	295
Case 3	Amos + Mountaineer CCR Only	5,140	6,876	3,539	3,501	19,057	(74)	993	[illegible]	[illegible]	622

2020 EIA Low Band without Carbon Commodity Price Forecast

		APCO NPV Revenue Requirements ($ Millions)					NPV of 2028 Retirement Net Cost/(Savings) versus Continued Operation Through 2040				
		2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period	2021-2027 Period	2028-2039 Period	2040-2050 Period	End-Effects Period	Total Study Period
Case 1	Amos + Mountaineer CCR & ELG	4,918	5,450	3,463	3,257	17,088			-		
Case 2	Amos CCR + Mountaineer CCR&ELG	4,867	5,974	3,293	3,194	17,333	(51)	524	[illegible]	[illegible]	245
Case 3	Amos + Mountaineer CCR Only	4,843	6,291	3,214	3,212	17,569	(70)	844	[illegible]	[illegible]	450

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EX. SN-5

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00015
Interrogatories and Requests for the Production of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF CONSUMER COUNSEL
OAG Set 9
To Appalachian Power Company

Interrogatory OAG 9-198:

Provide APCo's economic analyses supporting the assumed retirement dates for the Amos and Mitchell coal-fired generating units.

Response OAG 9-198:

See the Company's response to Staff 1-025, for the requested information for the Amos plant. Mitchell generating units are not owned or operated by the Company.

The foregoing response is made by Debra L. Osborne, VP Generating Assets APCO/KY, on behalf of Appalachian Power Company.

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00015
Interrogatories and Requests for the Production
of Documents by the STAFF OF THE STATE CORPORATION COMMISSION
Staff Set 1
To Appalachian Power Company

Interrogatory Staff 1-025:

Please refer to Schedule 2, page 8 of Company witness Cash's testimony. Provide a detailed discussion of the reasons, beyond the fact that the proposed retirement years for coal generating plants are consistent with the retirement years assumed in the depreciation study from Case No. PUE-2011-00037, for the expected retirement years of:
(a) 2040 for Mountaineer Unit 1;
(b) 2032 for Amos Units 1 and 2;
(c) 2033 for Amos Unit 3; and
(d) 2025 for Clinch River Units 1 and 2.

Response Staff 1-025:

The Company's scheduled retirement dates are not static and have changed over time, and will likely change in the future, as circumstances warrant. As a general matter, depending upon the type of generating facility, scheduled retirement dates are driven by one or more factors.
a)-c) APCo's Mountaineer Plant and Amos Units 1-3 are super-critical coal-fired generating units. Each will have operated approximately 60 years by their scheduled retirement dates, which are used for planning and depreciation purposes. APCo's current scheduled retirement dates for its coal-fired units are based upon a combination of the following factors: the Company's engineering judgment and operating experience regarding the physical condition and the expected useful life of major plant components; the cost to repair or replace major components at the time of failure; market prices for energy related to such things as natural gas prices; and the possible impact of public policy decisions such as environmental regulations and standards related to renewable generation.
d) Clinch Units 1 and 2 were originally placed into service as coal-fired units in 1958, followed by conversion to natural gas-fired operation in early 2016. The engineering design basis used for the conceptual design of the natural gas conversion project at the Clinch River Plant was a 10-year post gas conversion operating life. A high level evaluation of the existing equipment determined that this service 12qlife was achievable especially considering the existing predictive and preventive maintenance practices used at the site and the projected capacity factors of the units after the conversion. Since that time, routine assessments of the equipment at the facility have confirmed this conclusion.

The foregoing response is made by Debra L. Osborne, Title: VP Generating Assets APCO/KY, on behalf of Appalachian Power Company.

EX. SN-6

Exhibit SN-6

COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION
APPLICATION OF
APPALACHIAN POWER COMPANY
SCC CASE NO. PUR-2020-00258
Interrogatories and Requests for the Production
of Documents by the OFFICE OF THE ATTORNEY GENERAL'S DIVISION OF
CONSUMER COUNSEL
OAG Set 2
To Appalachian Power Company

Interrogatory OAG 2-009:

Please identify any significant changes since Case No. PUR-2020-00015 that have increased the forecasted economic value of continued operations of the Amos coal units and thereby justify continuing to operate the units until 2040 rather than retiring the units in 2032 and 2033?

Response OAG 2-009:

While there have been no significant changes that have increased the forecasted economic value since Case. No. PUR-2020-00015, that does not mean the Amos coal units cannot physically continue to operate until 2040.

The foregoing response is made by James F. Martin, Dir Resource Planning Strategy, on behalf of Appalachian Power Company.

EX. SN-7

210430133

Adjustment to Amos Compliance Project Depreciation Expense ($1000s)

			Source
1	Requested Amost Depreciation	$566	Sch 46, Sec 3, Stmt 1
2	Proposed Depreciation Rate	9.52%	Ross, p10, 10.5yrs
3	Adjusted Depreciation Rate	5.71%	Ross, p10, 17.5yrs
	Adjusted Depreciation Rate	$227	Ln1 - (Ln3/Ln2 x Ln1)

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Exhibit SN-7
Page 2 of 2

APCo Exhibit No. ___
Witness: JBS
Schedule 46
Section 3 Statement 1
Page 2 of 2

Appalachian Power Company
Case No. PUR-2020-00258
Environmental RAC (E-RAC)
Schedule 46, Section 3, Statement 1
Revenue Requirement- Amounts in $000s
For the Year Beginning October 1,2021

Line No.		Amos Capital Project		Mountaineer Capital Project		O & M Compliance Expenses
1 Average Rate Base	$	31,101	$	16,485	$	8,100
2 Weighted Average Cost of Capital		7.072%		7.072%		7.072%
3 NOI	$	2,200	$	1,166	$	573
Less Interest Expense on Debt						
4 Total Weighted Average Cost of Debt		2.444%		2.444%		2.444%
5 Average Rate Base	$	31,101	$	16,485	$	8,100
6 Revenue Requirement-Interest Expense on Deb	$	760	$	403	$	198
7 Net Income	$	1,440	$	763	$	375
8 Income Tax Gross-Up Factor		75.61%		75.61%		75.61%
9 Revenue Requirement-Net Income Including Taxes	$	1,904	$	1,009	$	496
10 Revenue Requirement-Financing Costs	$	2,664	$	1,412	$	694
Operating Expenses						
11 Total Rate Year Expenses	$	-	$	-	$	9,257
12 Pre-RAC Deferred Expenses					$	16,195
13 Depreciation Expense	$	566				
15 Revenue Requirement-Operating Expenses	$	566	$	-	$	25,456
Revenue Requirement Per Projected Cost Recovery Factor	$	3,230	$	1,412	$	26,149